Heat Pump Tool Box
Quick Reference Guide

Raypak® A Rheem® Company

Rheem

Swimming Pool Heat Pumps

WATER CHEMISTRY

(Corrosive water voids all warranties)

For your health and the protection of your pool equipment, it is essential that your water be chemically balanced. The following levels must be used as a guide for balanced water.

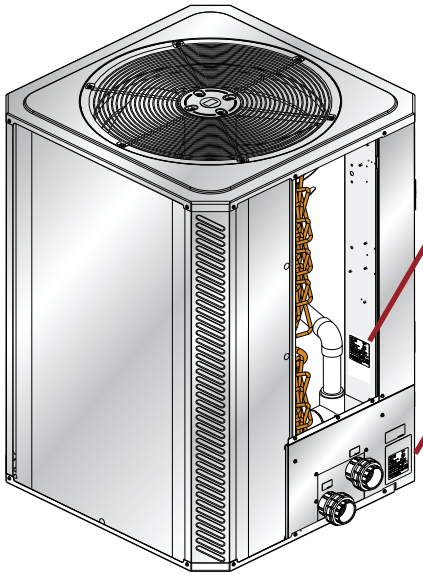
Recommended Levels	Fiberglass Pools	Fiberglass Spas	Other Pool & Spa Types
Water Temp. (Deg. F)	68 to 88	89 to 104	68 to 104
pH	7.3 to 7.4	7.3 to 7.4	7.6 to 7.8
Total Alkalinity (PPM)	120 to 150	120 to 150	80 to 120
Calcium Hardness (PPM)	200 to 300	150 to 200	200 to 400
Salt (PPM)	**4500 MAXIMUM**	**4500 MAXIMUM**	**4500 MAXIMUM**
Free Chlorine (PPM)*	2 to 3	2 to 3	2 to 3
Total Dissolved Solids (PPM)	**3000 MAXIMUM****	**3000 MAXIMUM****	**3000 MAXIMUM****

*Free Chlorine MUST NOT EXCEED 5PPM

** In salt water chlorinated pools, the total TDS can be as high as 6000PPM.

- Occasional chemical shock dosing of the pool or spa water should not damage the heater providing the water is balanced.
- Automatic chemical dosing devices and salt chlorinators are usually more efficient in heated water, unless controlled, they can lead to excessive chlorine level which can damage your heater.
- Further advice should be obtained from your pool or spa builder, accredited pool shop, or chemical supplier for the correct levels for your water
- Warning: Electrolytic Corrosion and pH instability may be present with salt chlorinated pools.

Model Number and Serial Number Location



Model & Serial number alternative location.

Model & Serial number can be found at rating plate.

Model Designation

R2350ti-E

- R = Raypak Brand
- 2 = Approximate Horsepower
- 3 = Classic Cabinet Design
- 5 = Model Revison
- E = Digital Control
- ti = Titanium Heat Exchanger
- 0 = 1 phase 208/230V

Before you call Raypak service, make sure you have the MODEL NUMBER and SERIAL NUMBER.

Clearances - General

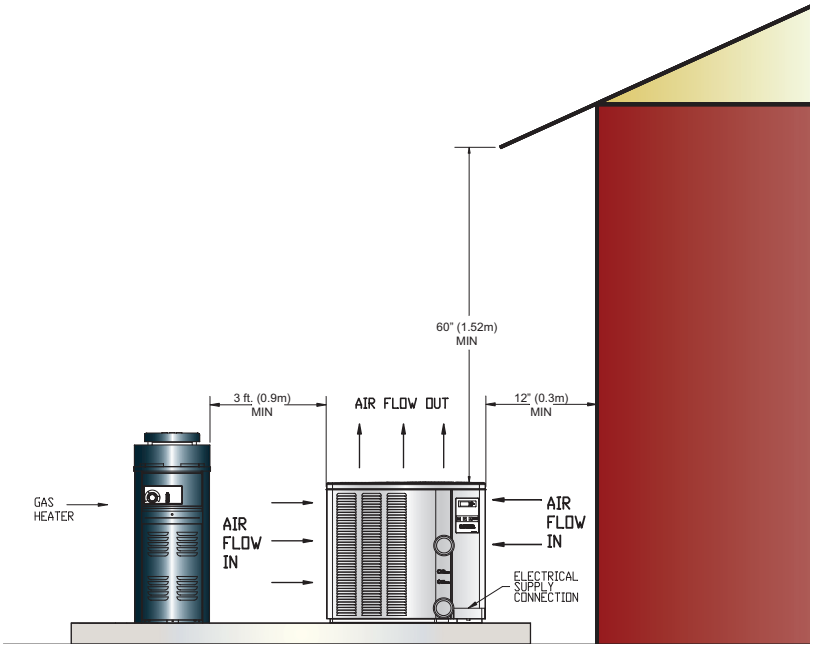
OUTDOOR ONLY

TOP: 60”
BACK: 12”
FRONT: 24”
LEFT SIDE: 12”
RIGHT SIDE: 12”
FLOOR: 0”

Heat Pump Placement

AS EASY AS 1, 2, 3

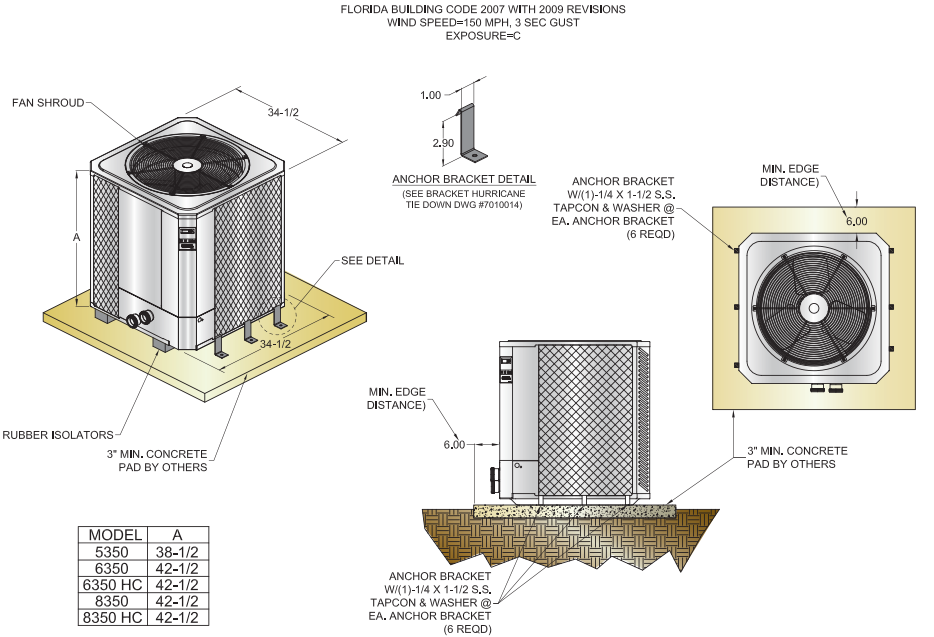
- 1 ft. (12 in.) clearance for air flow into the unit
- 2 ft. (24 in.) clearance for the heat pump access panels
- 3 ft. (36 in.) clearance from any gas heaters, air conditioners, or additional heat pumps.



Placement - 5350 thru 10353

When placing the unit avoid:

- Roof water runoff: use gutters or diverters.
- Water from sprinkler sytems: Cap or turn off sprinkler heads.


FLORIDA BUILDING CODE 2007 WITH 2009 REVISIONS
WIND SPEED=150 MPH, 3 SEC GUST
EXPOSURE=C
FAN SHROUD
34-1/2
A
SEE DETAIL
34-1/2
RUBBER ISOLATORS
3" MIN. CONCRETE PAD BY OTHERS
1.00
2.90
ANCHOR BRACKET DETAIL
(SEE BRACKET HURRICANE TIE DOWN DWG #7010014)
ANCHOR BRACKET W/(1)-1/4 X 1-1/2 S.S. TAPCON & WASHER @ EA. ANCHOR BRACKET (6 REQD)
MIN. EDGE DISTANCE)
6.00
MIN. EDGE DISTANCE)
6.00
3" MIN. CONCRETE PAD BY OTHERS
ANCHOR BRACKET W/(1)-1/4 X 1-1/2 S.S. TAPCON & WASHER @ EA. ANCHOR BRACKET (6 REQD)

MODEL	A
5350	38-1/2
6350	42-1/2
6350 HC	42-1/2
8350	42-1/2
8350 HC	42-1/2

Placement - 2350,3350,4350

When placing the unit avoid:

- Roof water runoff: use gutters or diverters.
- Water from sprinkler sytems: Cap or turn off sprinkler heads.

PAD SPECIFICATION:

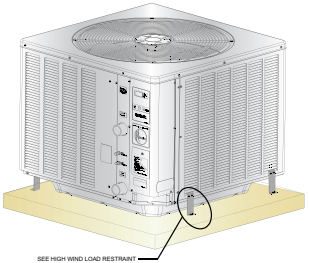
GREATER THAN OR EQUAL TO 2-1/2" THICK SOLID CONCRETE
3000 P. S. I. OR GREATER LOAD RATING
PAD LENGTH GREATER THAN OR EQUAL TO UNIT LENGTH +4"
PAD WIDTH GREATER THAN OR EQUAL TO UNIT WIDTH +4"

UNIT APPLICABILITY TABLE

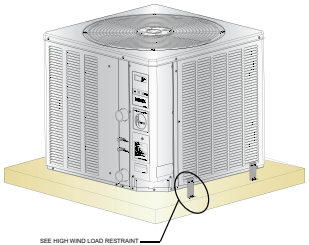
Models	Minimum Pad Dimension		Restraint Spacing	
	Length (in)	Width (in)	Minimum (IN)	Maximum (IN)
2350	32	32	20	26
3350	36	36	24	30
4350	36	36	24	30

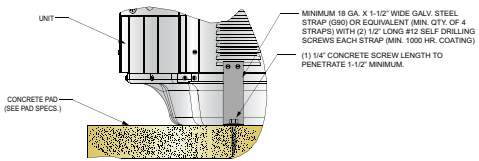
THIS DRAWING USED AS A GRAPHICAL IRE PRESENTATION ONLY AND IT MAY NOT APPEAR EXACTLY LIKE THE UNITS LISTED IN THE ABOVE TABLE.
THIS DRAWING INTENDED FOR POOL HEATERS ONLY (SEE HP / AC UNIT SPECIFIC RESTRAINT DRAWINGS.)

3350
4350

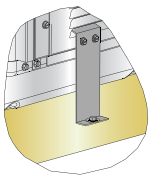


2350




UNIT
CONCRETE PAD (SEE PAD SPECS.)
MINIMUM 18 GA. X 1-1/2" WIDE GALV. STEEL STRAP (G90) OR EQUIVALENT (MIN. QTY. OF 4 STRAPS) WITH (2) 1/2" LONG #12 SELF DRILLING SCREWS EACH STRAP (MIN. 1000 HR. COATING)
(1) 1/4" CONCRETE SCREW LENGTH TO PENETRATE 1-1/2" MINIMUM.

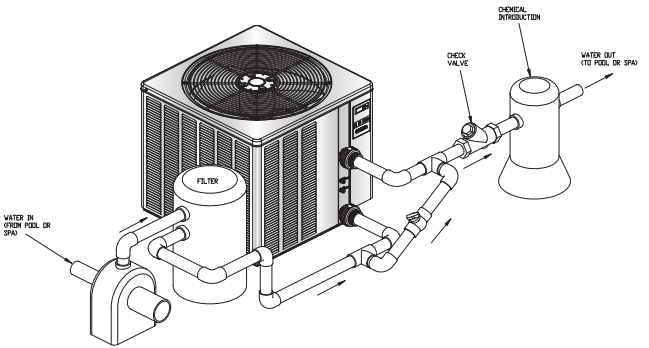
HIGH WIND LOAD RESTRAINT DETAIL 1



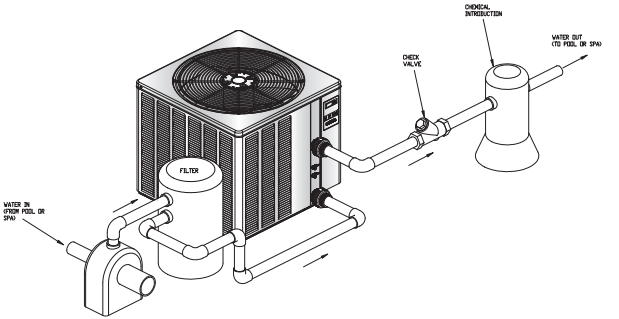
HIGH WIND LOAD RESTRAINT DETAIL 2

ST-A1188-19

Single Unit Plumbing



For Systems with flow that is difficult to regulate or that exceed requirements



For systems within flow requirements

All Raypak & Rheem heat pumps require a minimum of 30gpm, and can handle up to 60gpm before requiring the use of an external bypass.

Hydraulic Performance

RAYPAK / RHEEM 5350Ti & 5310Ti		
Flow Rate	Pressure Drop: PSI	Pressure Drop: TDH
10	1	2
20	2	5
30	4	9
40	7	16
50	10	23
60	11	25
70	12	28
80	13	30

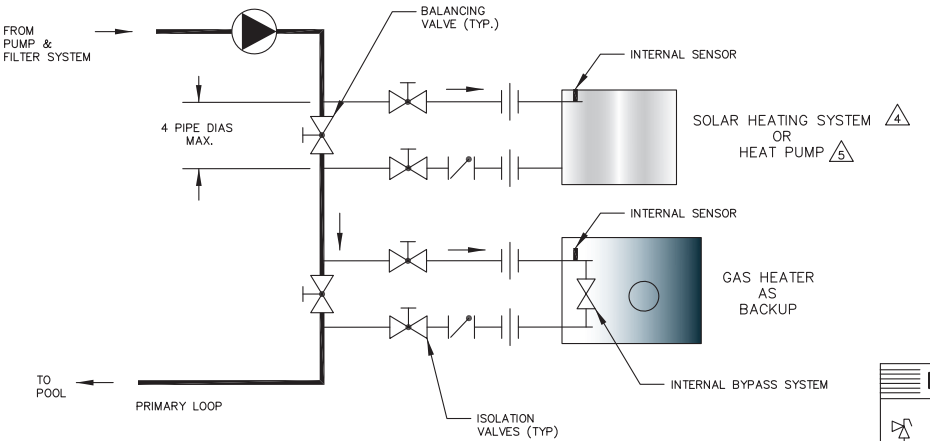
RAYPAK / RHEEM 8350Ti & 8320Ti		
Flow Rate	Pressure Drop: PSI	Pressure Drop: TDH
10	1	2
20	3	7
30	9	21
40	9	21
50	10	23
60	11	25
70	12	28
80	13	30

RAYPAK / RHEEM 6350Ti & 6310Ti		
Flow Rate	Pressure Drop: PSI	Pressure Drop: TDH
10	1	2
20	3	7
30	6	14
40	9	21
50	10	23
60	11	25
70	12	28
80	13	30

All Raypak & Rheem heat pumps require a minimum of 30gpm, and can handle up to 60gpm before requiring the use of an external bypass.

Alternate Heat Source

THIS PIPING DIAGRAM IS A RECOMMENDATION AND IS NOT INTENDED TO REPLACE AN ENGINEERED PIPING SYSTEM DESIGNED BY A PROFESSIONAL ENGINEER.



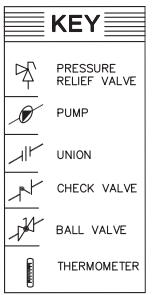
NOTES:

1. PLUMB SWING CHECK VALVE IN GRAVITY–CLOSED POSITION.
2. PIPE ALL RELIEF VALVES TO DRAIN, OR AS LOCAL CODES REQUIRE.
3. MINIMUM PIPE SIZE MUST BE EQUAL TO THE HEATER INLET/ OUTLET SIZE.

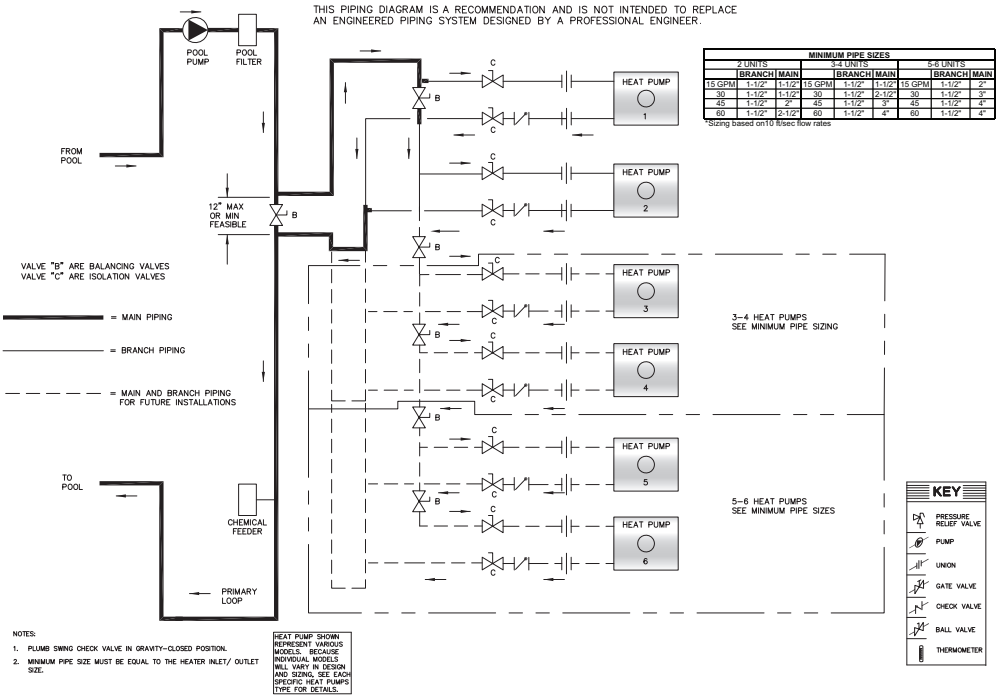
4 SOLAR SYSTEM MUST BE INSTALLED IN ACCORDANCE WITH SOLAR SUPPLIER'S INSTRUCTIONS INCLUDING, BUT NOT LIMITED TO, PROTECTION AGAINST OVERHEATING AND/OR FREEZE–UPS.

5 HEAT PUMP MUST BE INSTALLED IN ACCORDANCE WITH SUPPLIER'S INSTRUCTIONS INCLUDING, BUT NOT LIMITED TO, PROTECTION AGAINST OVERHEATING AND/OR FREEZE–UPS.

HEATERS SHOWN REPRESENT VARIOUS MODELS. BECAUSE INDIVIDUAL MODELS WILL VARY IN DESIGN AND SIZING, SEE EACH SPECIFIC HEATER TYPE FOR DETAILS.



Multi-Heat Pump Plumbing


THIS PIPING DIAGRAM IS A RECOMMENDATION AND IS NOT INTENDED TO REPLACE AN ENGINEERED PIPING SYSTEM DESIGNED BY A PROFESSIONAL ENGINEER.
POOL PUMP
POOL FILTER
FROM POOL
12" MAX OR MIN FEASIBLE
VALVE "B" ARE BALANCING VALVES
VALVE "C" ARE ISOLATION VALVES
= MAIN PIPING
= BRANCH PIPING
= MAIN AND BRANCH PIPING FOR FUTURE INSTALLATIONS
TO POOL
CHEMICAL FEEDER
PRIMARY LOOP
HEAT PUMP 1
HEAT PUMP 2
HEAT PUMP 3
HEAT PUMP 4
HEAT PUMP 5
HEAT PUMP 6
3-4 HEAT PUMPS SEE MINIMUM PIPE SIZING
5-6 HEAT PUMPS SEE MINIMUM PIPE SIZES
KEY
PRESSURE RELIEF VALVE
PUMP
UNION
GATE VALVE
CHECK VALVE
BALL VALVE
THERMOMETER
NOTES:
1. PLUMB SWING CHECK VALVE IN GRAVITY-CLOSED POSITION.
2. MINIMUM PIPE SIZE MUST BE EQUAL TO THE HEATER INLET/ OUTLET SIZE.
HEAT PUMP SHOWN REPRESENT VARIOUS MODELS. BECAUSE INDIVIDUAL MODELS WILL VARY IN DESIGN AND SIZING, SEE EACH SPECIFIC HEAT PUMPS TYPE FOR DETAILS.

MINIMUM PIPE SIZES

2 UNITS			3-4 UNITS			5-6 UNITS		
	BRANCH	MAIN		BRANCH	MAIN		BRANCH	MAIN
15 GPM	1-1/2"	1-1/2"	15 GPM	1-1/2"	1-1/2"	15 GPM	1-1/2"	2"
30	1-1/2"	1-1/2"	30	1-1/2"	2-1/2"	30	1-1/2"	3"
45	1-1/2"	2"	45	1-1/2"	3"	45	1-1/2"	4"
60	1-1/2"	2-1/2"	60	1-1/2"	4"	60	1-1/2"	4"

*Sizing based on10 ft/sec flow rates

Electrical Data

MODEL NO.	VAC in. - PHASE - Hz	MINIMUM CIRCUIT AMPACITY (A)	MAXIMUM BREAKER SIZE (A)
2350	208/230 - 1 - 60	23.0	35
3350	208/230 - 1 - 60	30.0	50
4350	208/230 - 1 - 60	34.0	50
5350	208/230 - 1 - 60	40.0	60
6350/6350HC	208/230 - 1 - 60	42.0	60
8350	208/230 - 1 - 60	42.0	60
	208/230 - 3 - 60	34.0	50

Typical System Electrical Power Requirements

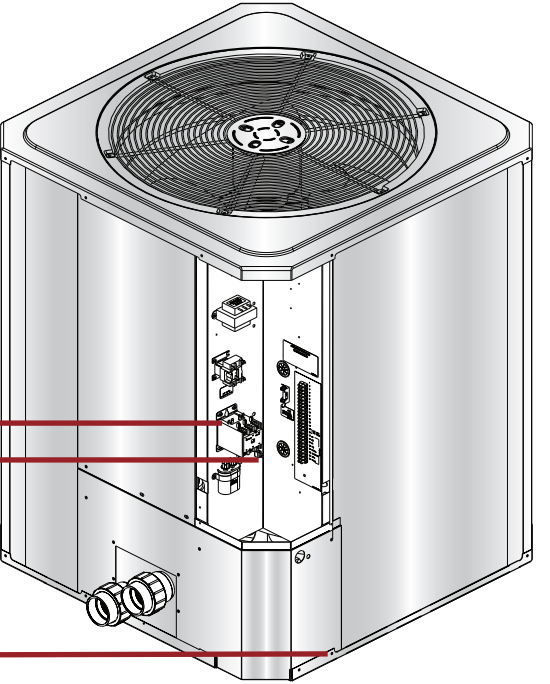
Maximum Wire Length From Breaker to Heater*

MODEL	POWER	MIN. CIRCUIT AMPACITY	12 ga	10 ga	8 ga	6 ga	4 ga
2350	208/230-1-60	23	75 ft	120 ft	192 ft	305 ft	485 ft
3350	208/230-1-60	30	NR	92 ft	148 ft	233 ft	372 ft
4350	208/230-1-60	34	NR	81 ft	130 ft	206 ft	328 ft
5350	208/230-1-60	40	NR	NR	110 ft	175 ft	279 ft
6350	208/230-1-60	42	NR	NR	NR	167 ft	266 ft
8350	208/230-1-60	42	NR	NR	NR	167 ft	266 ft
8350	208/230-3-60	34	NR	81 ft	130 ft	208 ft	328 ft

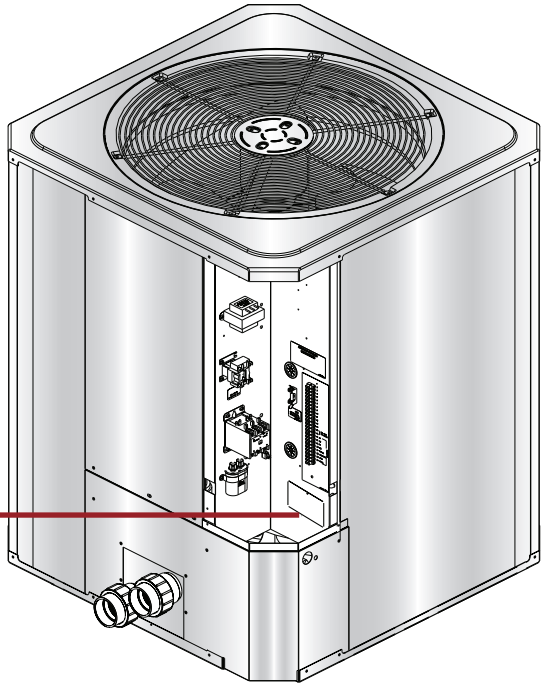
* Based on maximum voltage drop of 3% of 230 volts = 6.9 volts

This chart is only a guide, based on NEC calculations. State and local codes must be applied when applicable. Final specification of wire length and size should always be performed by a licensed electrical contractor.

Electrical Hook Up



Electrical Wiring Diagram



Electrical wiring diagram is located underneath the main terminal bar, behind the electrical access panel

Temp. Sensor 10k Conversion

^0F	OHMS	^0F	OHMS	^0F	OHMS	^0F	OHMS
58	16,123	72	11,305	85	8,249	98	6,097
59	15,711	73	11,029	86	8,056	99	5,960
60	15,310	74	10,761	87	7,867	100	5,827
62	14,921	75	10,500	88	7,684	101	5,697
63	14,543	76	10,246	89	7,506	102	5,570
64	13,820	77	9,999	90	7,333	103	5,446
65	13,473	78	9,758	91	7,164	104	5,326
66	13,136	79	9,525	92	6,999	105	5,208
67	12,809	80	9,297	93	6,839	106	5,094
68	12,491	81	9,076	94	6,683		
69	12,182	82	8,861	95	6,530		
70	11,882	83	8,651	96	6,382		
71	11,589	84	8,447	97	6,238		

For a given temperature, the resistance should be accurate to within plus or minus 1%. for a given resistance reading, the temperature should be accurate to within plus or minus 0.5%

Note: To read correct resistance you must use a meter capable of measuring to scale of 40K.

Temp. Sensor 5K Conversion

^0F	OHMS	^0F	OHMS
50	9,950	79	4,787
54	9,045	82	4,389
57	8,230	86	4,029
61	7,500	90	3,702
64	6,840	93	3,404
68	6,245	97	3,134
72	5,710	100	2,888
75	5,225	104	2,663

For a given temperature, the resistance should be accurate to within plus or minus 1%. for a given resistance reading, the temperature should be accurate to within plus or minus 0.5%
Note: To read correct resistance you must use a meter capable of measuring to scale of 40K.

Analog Start-Up

1. Verify that the power lamp is ON and that the pool/spa pump is running and circulating properly.

2. Verify that the control panel Spa-Remote-Pool switch is in the Remote (OFF) position.

3. Turn the control switch to either Pool or Spa to turn the system ON and raise the thermostat setting above the current water temperature. At this time the 2 green lamps should illuminate. The fan should start up almost immediately, and the compressor should start up after approximately 5min.

4. Allow the heat pump pool heater to operate for a few minutes after the compressor has started to stabilize operating pressures and to allow various component temperatures to normalize.

5. Verify that the discharge air temperature is approximately 8°F– 10°F cooler than the air entering the unit. If not, see the troubleshooting section.

Analog Control

Power (amber lamp): When lit, indicates power is applied to the unit.

Water Flow (green lamp): When lit, indicates normal water flow.

Heat Demand (green lamp): When lit, indicates the actual water temperature is below the target water temperature

Compressor Delay Active (amber lamp): Under normal operation, when lit, indicates compressor anti-short cycle timer is active. The fan will run but the compressor will be OFF for 6 to 8 minutes.

Defrost Active (red lamp): When lit, indicates unit is in defrost mode. Defrost mode occurs when ice starts to form on the outside coil. The fan will continue to run but the compressor will stay OFF (not heating) until weather conditions improve.

Low Pressure (red lamp): When lit, indicates failure in the refrigeration circuit. When this lamp is ON, service is required. Call for service assistance.

Thermostat Setting

Press the SET key key until you see P-S.

Press up and down arrow keys choose between the Pool Thermostat (POL) or the Spa Thermostat (SPA).

Want to make the Board a “Pool ONLY” Board? Please call 800-260-2758 for instructions.

Water Temperature

Press the SET key until you see POL is for pool and SPA is for spa. The current programmed temperature will be displayed.

Press the up or down arrow to increase or decrease the temperature setting one degree at a time.

After aproximetly 5-7 seconds the current pool water temperature will display.

DIGITAL CONTROLS

Want to make the Board a “Pool ONLY” Board? Please call 800-260-2758 for instructions.

Unit Settings

Press the SET key until you see the F-C on the screen.

Press up and down arrow keys.
Select either F (Farenheit) or C (Celsius).

After aproximetly 5-7 seconds the current pool water temperature will display.

Want to make the Board a “Pool ONLY” Board? Please call 800-260-2758 for instructions.

Digital Start Up

1. Verify that the digital board is displaying a temperature, the pool pump is running and water is circulating properly.

2. Verify that the board is programmed so that the desired temperature of the pool or spa is higher than the displayed current water temperature.

3. Allow the heat pump pool heater to operate for a few minutes to stabilize operating pressures and to allow various component temperatures to normalize.

4. Verify that the discharge air temperature is approximately 8°–10°F cooler than the air entering the unit. If not, see the troubleshooting section.

Heat Cool Units

Press the SET key until you see the H-C on screen

Press up and down arrow keys to select HEA (heat), COL (cool), or AUT (auto).

- See page 21 to set desired set point temperature.
- The heat mode will raise the temperature of the water whenever it falls below the set point
- The cool mode will lower the temperature of the water whenever it rises above the set point
- In auto mode, the unit will automatically toggle between heat and cool mode in order to maintain the set temperature. This allows for full automatic enjoyment of the unit's capabilities, regardless of whether there is a capable automation controller on site
- DO NOT connect an automation controller to the heat pump pool heater if you plan on utilizing auto mode.

Digital Fault code-OFF

The desired programmed temperature point is lower than 60℉ (15℃).

Digital Fault Code-LP

Shortage of refrigerant gas in the unit or faulty low pressure control.

The unit will show (LP3) after 3 LP faults and will shut down the unit for its protection.

If this occurs, you should call for service.

Digital Fault code-HP

The high pressure switch within the refrigerant circuit has been engaged. This is usually a result of low water flow to the unit or a faulty high pressure control.

The unit will show HP6 after 6 HP faults. This will stop the unit for protection.

Check water flow to the unit, clean all debris traps, and clean/backwash pool filter if necessary. If code persists, please call Heat Pump Services at: (800) 375-7378.

Digital Fault Code-FLO

Possible causes:

- The filter is in backwash position
- The filter pump is stopped.
- The filter is dirty or there is debris in the basket(s)
- Shortage of water to pool pump.
- Water pressure switch must be adjusted or it is broken.

The unit will show “FL3” after 3 FLO faults; The unit will also shut itself down for protection

Digital Fault code-FS

Unit is in the defrosting cycle which means that the fan is operating but the compressor has been stopped.

A numerical digit behind the FS indicates how many times the unit has switched into this mode

Digital Fault Code --

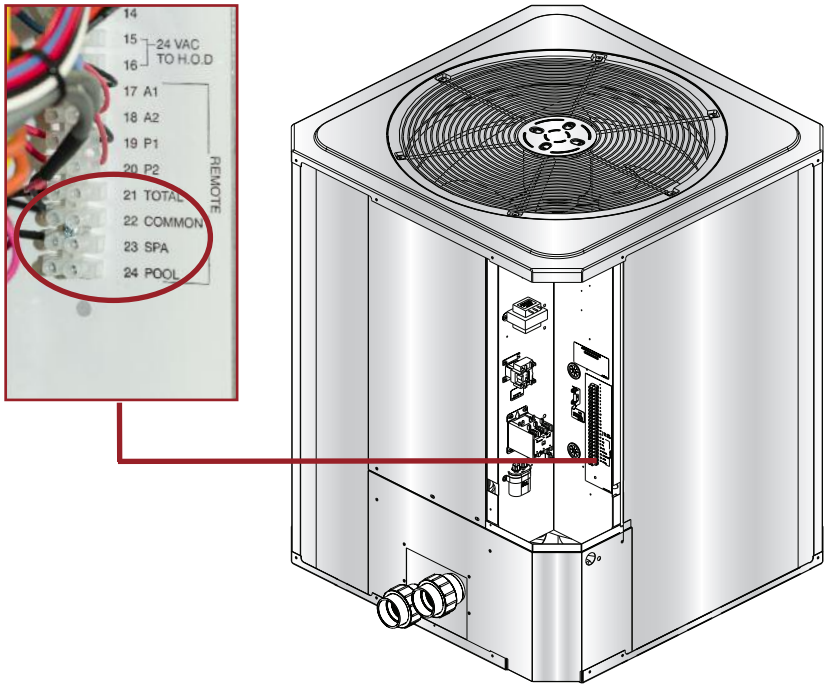
Keypad is pressing down on both buttons.

Keypad needs replacement.

Electrical Automation

2-Wire Controller
Connect the two wires from the automation device to the TOTAL and COMMON connections on the heat pump pool heater's wiring block.

3-Wire Controller
Connect the three wires from the automation device to the COMMON, SPA, and POOL connections on the heat pump pool heater's wiring block.



Analog Control

Heat pump with analog controls

- Set the MODE selector dial to “REMOTE”
- Set both THERMOSTATS to the highest desired temp for the respective body of water
- Enable heat pump pool heater on the automation controller

Digital Control

Make sure heat pump pool heater is disabled on automation controller. Push the SET key until "POL" is displayed

Push the DOWN ARROW key until "OFF" is displayed

After approximately 5-7 seconds the current pool water temperature will display.

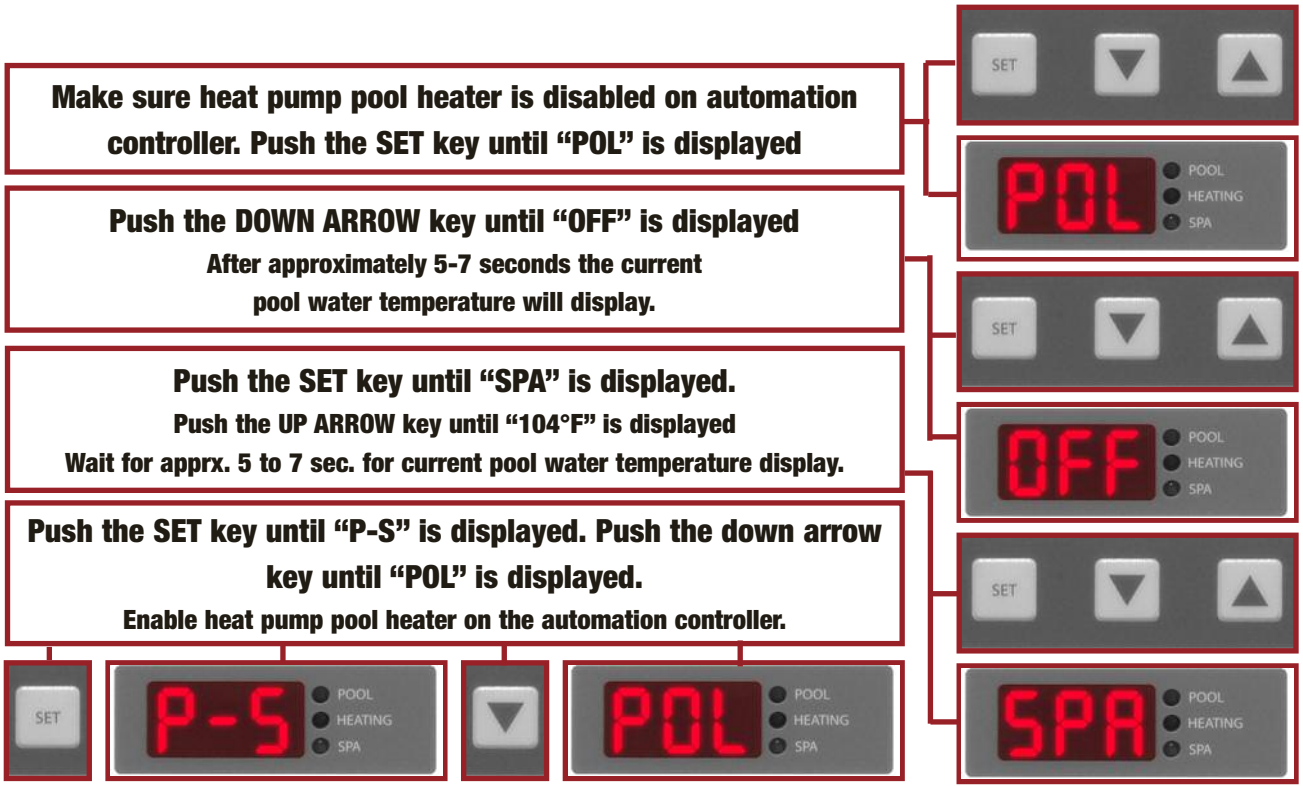
Push the SET key until "SPA" is displayed.

Push the UP ARROW key until "104°F" is displayed

Wait for apprx. 5 to 7 sec. for current pool water temperature display.

Push the SET key until "P-S" is displayed. Push the down arrow key until "POL" is displayed.

Enable heat pump pool heater on the automation controller.



Unit Not Running?

Check power supply:
- Is the power light or digital display on?
- Is the circuit breaker assigned to the heat pump in the right position?
- Is the heat pump's internal fuse blown?

Thermostat and automation temperature settings:
- Is the unit "Calling for Heat" Is there a heat demand light or Display Code
- Is the thermostat set for a temp lower than the current water temp?

Automation settings:
- Is the unit set for automation, but the automation is off or not in "heating mode" ?
- Is the automation T-stat set for a temp lower than the current water temp?
- Is the heat pump set at a temp that allows the automation to do its job?

Compressor time delay:
- To prevent damage, a Time-Delay Mechanism prevents unit from running for apprx. 5 min. after being shut OFF.

Unit Not Heating

Does the Ejected Air from the unit feel 8 to 10degF cooler that the outside Temp? This is your first indicator of whether the unit is extracting heat from the air:

- If YES: the unit itself is working; there could be a problem with water flow, the system, or the jobsite
- If NO: the unit will probably need a service call.

Is water condensing on the evaporator coil and copper piping?

- This is another indicator as to whether the unit is extracting heat from the air; outside conditions can affect the amount of condensation produced.

Is water flow through the unit adequate?

- Check system for debris in the baskets, dirty filter, improperly set valves, etc.

How was the unit sized for the jobsite? Refer back to sizing analysis and results to confirm:

- Length of time unit is expected to achieve its goals
- Unit on site is the size specified
- All parameters were properly accounted for in the sizing (water features, location, etc.)

Unit Leaking

Heat pumps can produce a large amount of condensation during operation. Shut OFF Heat pump BUT leave pool pump ON

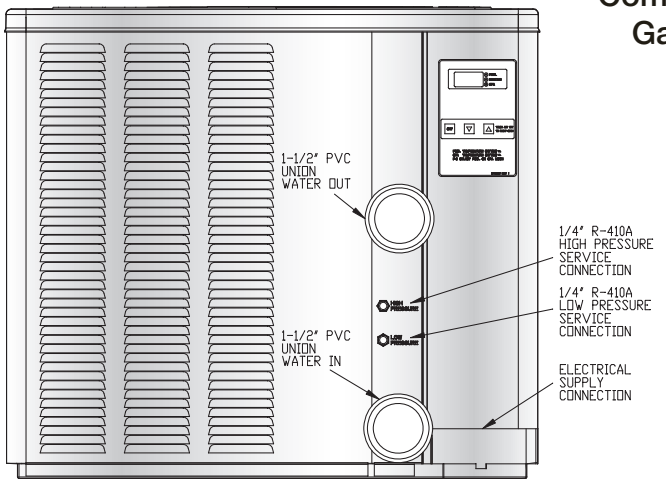
- If the water/dripping eventually stops, the unit is NOT leaking
- If the water continues to leak from the unit at the same rate for an extended period of time, the unit will probably need a service call.

Unit Not Talking With Automation

Take the heat pump out of "Remote Mode" to verify functionality

- If the unit begins to function correctly, the problem is most likely with either the connections to the automation controller or the automation controller itself.
- Use the manual to verify that both wiring and control settings are correct

Refrigerant Testing



Licensed HVAC Contractors: Temperature/Pressure charts and other related Refrigerant Circuit data available upon request @ 800.260.2758

Heat Pump Sizing Program

Raypak
A Rheem Company
Sizing For Heat Pump
HOME
Selected Unit: 10353ti-HC
Unit Amount: 1
Country: United States
State: FL, Florida
City: Miami – Miami Internation
Area Yes No
Size of Pool: 400 sq. ft.
Using Gallons? Yes No
Pool Depth: 4.5 ft.
Pool temp.: 82 °F
Runtime: 16 h/day
Pool Location: Outdoor
Solar Exp.: 50% sun / 50% shade
Wind Speed: 0-1.5 MPH
Solar Blanket: None
Energy values shown below are National averages.
Check your local utilities for your current energy rates.
Gas /Therm: 1.101
Electricity /kwh: 0.1165
Propane /gal.: 2.53
Print
Customer Information
Select All
Water Temp.
Air Temp.
Temp. Rise/hr.
Electric
Nat. Gas
Propane
Savings
January 82°F 68°F 1° $124 $247 $621 $123
February 82°F 69°F 1° $101 $202 $507 $101
March 82°F 72°F 1.1° $76 $158 $396 $82
April 82°F 75°F 1.1° $55 $113 $284 $58
May 82°F 79°F 1.2° $21 $45 $113 $24
June Off 82°F Off 0 0 0 0
July Off 83°F Off 0 0 0 0
August Off 83°F Off 0 0 0 0
September Off 82°F Off 0 0 0 0
October 82°F 78°F 1.2° $27 $59 $148 $32
November 82°F 73°F 1.1° $70 $146 $366 $76
December 82°F 69°F 1° $116 $232 $582 $116
Recalculate
Reset to Default
$590 $1202 $3017 $612

visit www.raypak.com or www.rheem.com/prodcuts/pool_spa

Heat Pump Tool Box
Quick Reference Guide

Before You Call

Heat pump not running? Did you check the power supply, the thermostat and automation temperature settings, & automation controller's heater settings? Has it been less than apprx. 5min since the unit last shut down? See page 34

Heat pump running, but not heating? Does the ejected air from the unit feel 8 to 10 ℉ cooler than the outside temp? Is water condensing on the evaporator coil and copper piping? Is water flow through the unit adequate? Have you double-checked the unit's sizing for the jobsite? See page 35

Heat pump is apparently leaking? Remember that these units can produce a large amount of condensation during operation. Did you perform the "shut-off test" while the pool pump is still running? See page 36

Heat pump not "talking" to automation? Did you take the unit out of "Remote Mode" to see if it would run? Have you verified both the wiring and all control settings? See pg. 37.

THIS IS NOT A SUBSTITUTE FOR THE INSTALLATION AND OPERATION MANUAL.
THIS MANUAL IS INTENDED TO HELP THE SERVICE TECHNICIAN WITH BASIC TROUBLESHOOTING.

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01/01/2012